

Perspective

Towards a Butterfly Economy: Reimagining Economics for Healthy Human–Nature Relationships

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Abstract

It is widely accepted that preserving biodiversity requires transformative change and, perhaps foremost, demands a paradigm shift in economic scholarship. The prevailing neoclassical growth-based status quo is too often detached from nature and, as a result, ill-equipped to offer insights on how to halt biodiversity loss. This perspective paper builds on the famous cowboy–spaceman economy distinction by presenting an analogy from the natural world. Proposals from post-growth schools of economic thought on how to induce metamorphosis of the growth-based caterpillar economy are described. Thereafter, an exploration is undertaken of a butterfly economy based on three propositions: embed economics in ecosystems, in systems thinking, and in human–nature relationships. Herein, examples are provided of nature-literate economics, policy implications are discussed, and an actionable research agenda is outlined. The perspective closes by drawing on discussions from conservation sciences to inspire the design of an economic framework conducive to healthy human–nature relationships.

Keywords: biodiversity conservation; economics; interdisciplinarity; post-growth; transformative change

1. Introduction

The biodiversity crisis is arguably the grandest of grand challenges. At present, roughly a third of species assessed by the International Union for the Conservation of Nature face elevated extinction risks [1]. Rather than “curators of wildlife” [2], conservationists now act as firemen trying to save books from a burning library [3,4], with the flames being fanned by complex, interrelated problems (e.g., climate change [5], poverty [6], and pandemic threat [7]). Notwithstanding certain successes [8], the conservation movement has been unable to “bend the curve” of biodiversity loss [9]. In this context of polycrisis, leading conservation institutions are calling for transformative change [10,11], defined by the Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services as “a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values.” [12] (p. 889).

The need for such transformative change is perhaps most pressing in the field of economic scholarship, due to its influence over both business strategy and policymaking [13,14]. The prevailing neoclassical economic paradigm is ill-equipped to resolve the biodiversity crisis due to its disconnect of economic activity from the biosphere [15,16]. A prominent example is Solow’s growth model, which uses a production function that does not distinguish natural capital from other types of capital and assumes that “there is



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no scarce nonaugmentable resource like land” [17] (p. 67). Solow argued that the relative scarcity of natural resources mitigates concerns over their absolute scarcity, since higher prices provide a balancing feedback loop through innovation and substitution [18]. Yet, this argument overlooks that natural resources deserve consideration as a distinct form of capital due to their susceptibility to ecological tipping points, potentially irreversible collapse, and incommensurable values [16,19–21]. Other caveats to Solow’s argument are that services from natural capital in many ecosystems lack prices and, where markets exist, there is no guarantee that this balancing force keeps consumption within sustainable levels.

Boulding famously described such growth models as the ‘cowboy economy’, involving a cowboy who perceives no limits to colonizing new lands, thereby promoting expansion [15]. Using an analogy from the natural world, one could describe this growth-oriented economy as its caterpillar stage. By contrast, Boulding portrayed economic activity embedded in the biosphere as the ‘spaceman economy’, in which growth is no longer desirable because all stocks are finite. Rather than being motivated by limited stocks, the butterfly stage of the economy replaces growth with sustainability and resilience as desiderata in response to abundant fossil fuel stocks. To root butterfly economics in biodiversity conservation and eudaimonia, it interprets “sustainability as the *possibility* of all forms of life to flourish forever” [22] (p. 24). Following such a strong sustainability criterion [23], the objective to promote flourishing of current and future generations is best served by pursuing resilience [24].

Neoclassical economics has so far remained the dominant economic paradigm, despite behavioral and ecological economists’ efforts to challenge its foundational assumptions for decades [25–27]. This persistence may be in part owed to disciplinary dominance in editorial boards [28] and in part to the lack of a unified alternative paradigm [29]. However, the building blocks for a new economics are becoming increasingly clear: economic theory needs to recognize limits to growth, limits to the substitutability of natural resources, and should aim for regenerative design [29]. Such a heterodox ‘butterfly economics’ can include neoclassical analyses, provided these efforts follow said principles.

Embedding contemporary economics in the biosphere is of vital importance because (i) the direct drivers underlying the biodiversity crisis (i.e., habitat loss, direct use, climate change, pollution, and invasive species) are the result of unsustainable consumption and production patterns [10,12], (ii) more than half of global GDP depends directly on nature [30], (iii) the global value of (non-marketed) ecosystems services outweighs global GDP [31,32], and (iv) biodiversity promotes ecosystem efficiency [33], ecosystem stability [34], and mitigates the transmission of infectious diseases [7,35]. There is also mounting quasi-experimental evidence on the social costs of species collapse in terms of both human health and livelihoods [36–39].

Contrary to the neoclassical assumption of stable preferences, it has become increasingly evident that human–nature relationships are conditional on environment and experience [40–50]. A growing disconnection with nature, also known as the extinction of experience feedback loop [40,41], environmental generational amnesia [42,43], or a nature-deficit disorder [44,45], poses a fundamental challenge to long-term sustainability [46]. This gradual erosion of human–nature relations is driven by trends such as urbanization [47,48], increasingly indoor lifestyles [49,50], and nature disappearing from cultural products such as books, song texts, and film scripts [51]. The loss of opportunity to experience nature undermines nature appreciation and conservation efforts, creating a reinforcing feedback loop that leads to further loss of possibilities to enjoy nature. Beyond public support for conservation, healthy human–nature relations promote both physical and mental well-being [35,52,53].

This perspective paper is structured as follows: In Section 2, post-growth perspectives on how to activate pupation of the caterpillar economy are explored, highlighting conditions for a desirable butterfly economy. In Section 3, examples are provided of economics informed by natural sciences that support three propositions, followed by policy implications and suggestions for future research. Lastly, in Section 4, the paper concludes with discussions from conservation sciences, with the proposal that a biodiversity-centered economy provides the best prospects for human survival.

2. Inducing Metamorphosis of the Caterpillar Economy

2.1. *Steady-State Economics*

Advocacy of a steady-state economy dates back to the mid-nineteenth century, when John Stuart Mill expressed hopes that humanity would find prosperity without growth before limits become binding [54,55]. Mill recognized that economic growth must have natural limits, that a stationary state does not prevent human development, and that protecting nature from unabated growth encourages human flourishing [54]. Yet, critiques on the relentless pursuit of economic growth intensified around the time of the 1970s oil crisis [15,25,56,57]. Motivated by the second law of thermodynamics, these early post-growth perspectives focused on the logical impossibility of sustaining endless growth. Herman Daly argued that neoclassical economics' focus on relative scarcity and its dismissal of relative human wants gives rise to 'growthmania' and 'uneconomic' growth, whereby the social costs from economic expansion outweigh the social benefits [57,58].

Daly was first to imagine a post-growth economy, formulating both policy objectives and institutional design principles for such a zero-growth steady state [57,59]. Policy objectives include population stabilization, maintaining productive capacity, and reducing inequality. Allocative efficiency could be considered as a fourth stretch goal (instead of the primary objective, as is the case in neoclassical models). Regarding institutional design principles, the transition to this steady-state economy should start from current conditions and balance gradually tightening constraints with maintaining personal freedoms (rather than supplanting existing institutions to achieve imaginary conditions overnight). Policy design should leave slack between environmental pressure and absorptive capacity, with it benefiting from near-term planning cycles with regular evaluation, i.e., it should put minimum faith in planning abilities and maximum confidence in nature's regenerative capacity.

Regarding specific policies, Daly favored cap-auction-and-trade to stabilize resource use and advocated controlling throughput at the input stage [57]. Since a steady-state economy cannot appeal to 'trickle down' arguments that growth benefits all, Daly proposed to address inequality by establishing both maximum and minimum incomes [57]. In his later works, he also suggested curtailment of the money-creating abilities of private banks by establishing full-reserve requirements [59,60]. Simulations suggest that the growth imperative of financial capital can be reconciled with zero-growth in the aggregate and that a steady state can reduce inequality [61,62].

It is important to note that steady-state economics differs fundamentally from steady-state growth paths [17]. The zero-growth objective of the steady-state economy is sometimes mistakenly confused with the end of progress [63,64]. However, in this context, discussion benefits from distinguishing between growth and development: growth is best understood as the quantitative increase in material flows, whereas development refers to qualitative increases in the service derived from these material flows. To clarify, the zero-growth objective does not rule out technological advances nor does it prevent the pursuit of happiness. Schumpeterian endogenous growth models—in which production functions consist of labor, intermediate goods and a fixed amount of land—can arguably be aligned with steady-state economics, if the endogenous growth consists entirely of development [65].

Notably, the rate of development can become uneconomic due to negative externalities from obsolescence [65].

Some of the principles established by steady-state economics can be recognized in other post-growth schools of thought; however, it has also been critiqued “that steady-state economics consists in an attempt to squeeze neoclassical economics into a biophysical and ethical corset” [66] (p. 52). In addition, while the transition to a steady state may have been a feasible strategy for sustainability in the 1970s, current ecological footprints require an estimated regenerative capacity of 1.8 Earths [67]. It has also been questioned to what degree ‘macro level’ theorizing on a desirable steady-state level of the economy is sufficiently sensitive to economic realities such as unsustainable lock-ins [66].

2.2. Degrowth

As no high-income countries maintain per capita ecological footprints within Earth’s regenerative capacity [67], sources in the degrowth literature promote scaling down economic activity to return within safe planetary boundaries [34,58,68–74]. It challenges the notion that economic growth eventually benefits the environment beyond a certain income level. This hypothesized inverted U-shaped relation between income and environmental degradation is also known as the Environmental Kuznets Curve (EKC) [75,76], or by its ‘green growth’ modern equivalent [72]. Excluding some pollutants with localized negative human health impacts [76,77], empirical evidence generally does not align with the EKC hypothesis [72,76,78–81].

Green growth proponents usually trust in technological advances to offset ecological impacts from rising affluence [82]. While the IPAT-identity that separates Impact by People times Affluences times Technology illustrates how this is theoretically possible [83], growth proponents usually omit that such compensation requires absolute decoupling of economic growth from ecological footprints at a rate that exceeds historical rates manifold [72,84,85]. Moreover, technological advance is often accompanied by behavioral rebounds that negate the engineering savings, either completely or in part [72,86,87].

Combined with increasing ecological footprints since the 1970s, global income gaps have only widened [88–91]. Reducing inequality is central to the degrowth literature, both in terms of reducing claims on absorptive capacity by high-income regions to create space for low-income regions where growth may still be desirable [69], and by theorizing how to reduce the (ecological) unequal exchange that exacerbates global inequality [92,93]. Degrowth policy proposals aimed at reducing inequality include the cancellation of public debts of low-income and middle-income countries, reductions in hours in typical work weeks, ‘green’ job guarantees, and provision of universal basic incomes, financed through wealth taxes and other forms of progressive taxation [73].

Other degrowth policy proposals comprise investments in public services, targeted phase-out of fossil fuels, and reducing production in ‘non-vital’ industries [73]. While it is debatable what qualifies as less-necessary production, various governments imposed restrictions on non-vital professions during the COVID-19 pandemic. Degrowth emphasizes exnovation of fossil fuels as part of the energy transition rather than innovation and expansion of renewable energy production, since the latter often only adds to existing production capacity (rather than displacing polluting production) [84,94,95]. Exnovation policy can help soften the negative externalities from the creative destruction that renders old technologies obsolete [65,96]. Sufficiency measures, aimed at reducing emission-intensive consumption (e.g., flights, meat, or private cars), provide another complementary strategy to innovation [97]. Improvements in public services likely enhance the palatability of such sufficiency strategies, which, combined, have substantial potential for decarbonization [98].

Degrowth is sometimes equated with recession [82]. However, unlike unplanned and socially destructive recessions, degrowth is an intentional strategy to achieve social and ecological objectives [73,84]; rather, degrowth aims to alleviate the disruption caused by boom–bust cycles [99]. A critique of the degrowth literature is that it presents more opinion than analysis [100], yet policy evaluation is difficult when there exist few degrowth experiments. A notable exception can be found in Bhutan, which “put in place a number of original policies limiting GDP growth and seeking to enhance wellbeing and sustainability. One can cite: free education and healthcare for all; severe restrictions on foreign investments; no WTO membership; no outdoor advertising; heavy taxes on car imports; severe limits on mass tourism (and ban on alpinism); limits on mining; half of the country under protected areas; constitutional 60% of forest cover; declared willingness to shift to 100% organic agriculture.” [101] (p. 356).

2.3. Complex System Analysis

A third strand of literature that can be considered under the post-growth header is the analysis of complex systems [25,46,102,103]. Complex system scholars conjecture that growth is usually the result of a reinforcing positive feedback loop and that growth can only be sustained temporarily in a closed system. At some point, a counteracting negative feedback loop provides a balancing force, or the system will destroy itself [102]. A popular notion in complex systems analysis is the idea of leverage points, defined by Donella Meadows as “places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything.” [102] (p. 1). Meadows’ list of leverage points with increasing effectiveness was later grouped into four levels of system characteristics: parameters, feedbacks, design, and intent [103].

The related literature on complex systems includes the work of Elinor Ostrom on socio-ecological systems, which was inspired by the tragedy of the commons by Garrett Hardin [104–110]. Hardin described a tragedy with common-pool resources, where open access would lead self-interested individuals to deplete the commons, since any individual resource-saving behavior would be offset through increased consumption by another individual [104]. Ostrom questioned both the inevitability and generality of the tragedy of the commons by describing examples where self-organization of group ownership had protected the sustainability of local commons [105], sometimes for centuries [32]. She later proposed a general framework for commons regulation to aid socio-ecological systems in achieving sustainable outcomes [106], where the importance of polycentric governance is echoed in the recent literature [13,107]. There seems to be fading support for the management principle of graduated sanctions: self-governing commons that survived more than 200 years made little use of sanctions [108,109], possibly due to sanctions being difficult to enforce in tight-knit communities [110].

The proposition that minuscule differences at one place in a system can soon induce dramatic differences elsewhere is akin to the suggestion of a butterfly effect, whereby Edward Lorenz’s butterfly metaphor illustrates the limited prediction horizons in complex systems [111]. A challenge with the leverage points concept is to identify where one can find such levers to intervene. Yet, in such cases, causal loop diagrams can offer a helpful visual tool (e.g., [112]), especially for difficult-to-observe telecoupled impacts from international trade [113–116]. Figure 1 presents such a causal loop diagram for butterfly economics, placing biodiversity conservation at its center. It summarizes the relations described in the introduction while acknowledging that exceptions to these stylized relations exist.

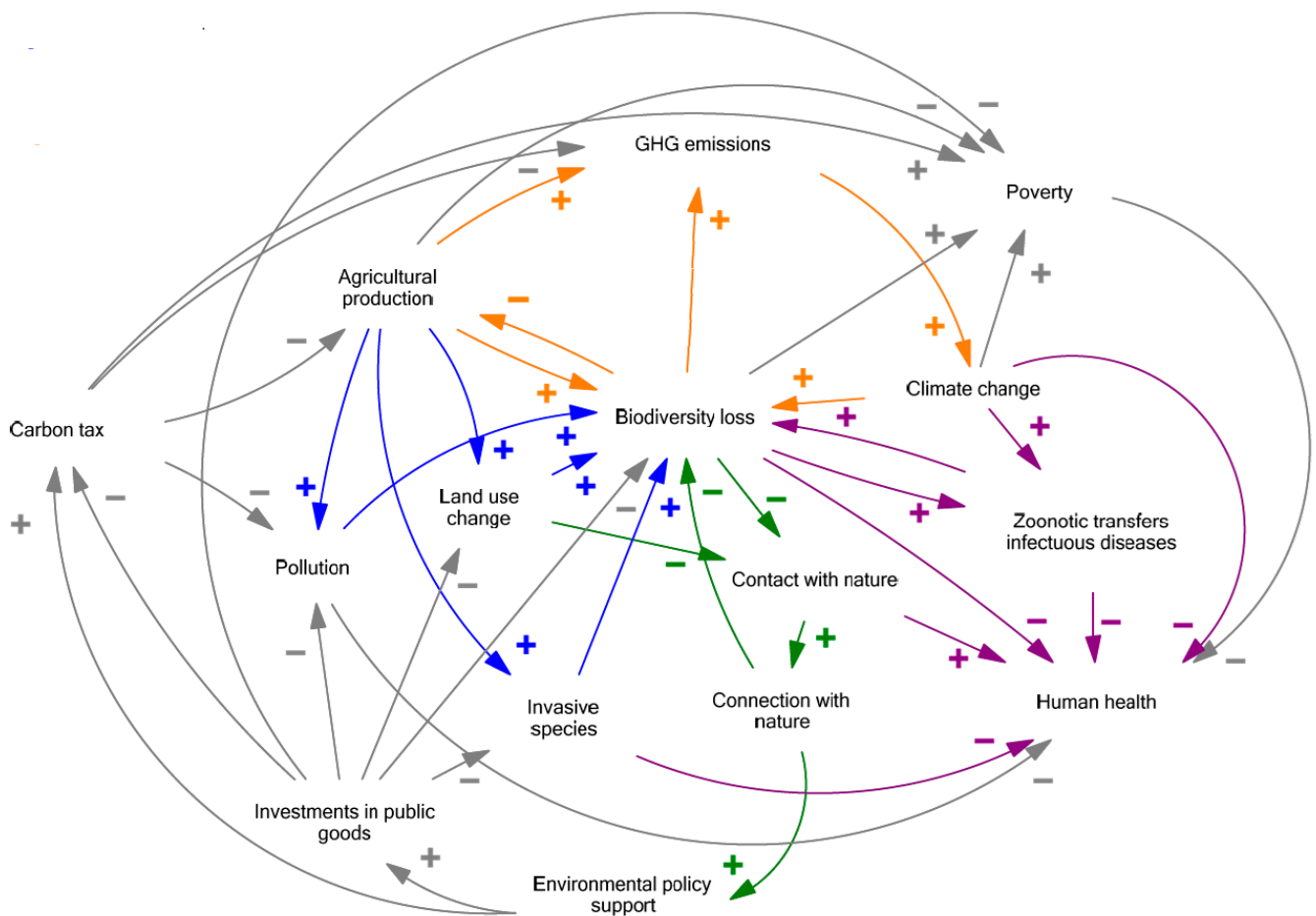


Figure 1. Causal loop diagram with the main drivers of biodiversity loss.

Legend to Figure 1: Interactions with agricultural production based on [112] in orange, complemented with the main drivers of biodiversity loss according to [12] in blue, extinction of experience as described in [41] in green, with human health feedbacks based on [7,35,53,116] in purple, and more speculatively with poverty and policy in grey. Direct use as a main driver of biodiversity loss is subsumed under the effect of agricultural production on biodiversity loss. The arrows depict direct drivers, where the plus and minus signs indicate a positive and negative relations, respectively. The diagram illustrates several reinforcing feedback loops, such as between biodiversity loss and climate change through reduced carbon sequestration or between biodiversity loss and zoonotic disease transfer. The diagram describes a balancing feedback loop between agricultural production and biodiversity loss, where increased agricultural production induces biodiversity loss (either directly or indirectly through land use change, pollution, or invasive species) and biodiversity loss in turn decreases agricultural output.

3. Imagining a Butterfly Economy

3.1. Embed Economics in Ecosystems

It is the abundance of fossil fuels rather than their pending scarcity that poses the most urgent threat to sustainability: The embedded emissions in known fossil fuel resources are roughly an order of magnitude greater than the carbon budget corresponding to a 50% probability of limiting global warming to two degrees Celsius [117–119]. Even when only considering the subset of fuel reserves—the resources where exploitation is profitable given present-day conditions—the embedded emissions are easily thrice a Paris Agreement-consistent carbon budget [117]. The finding that a majority share of fossil reserves should

remain untapped implies that a carbon bubble of stranded assets inflates global stock markets [120].

To expedite the phasing out of fossil fuels, the status quo in economics is to price carbon emissions at estimated social costs through taxation or emission markets [121]. Giving weight to natural capital in integrated assessment modeling exercises raises the social costs of carbon estimates [122,123]; however, the practice of equating marginal consumption benefits and ecological damage remains one of weak sustainability. When adopting strong sustainability criteria, carbon pricing should be based on cost-effectiveness analysis [124,125]. Figure 1 depicts how investment in public goods is a complementary policy towards decarbonization and, hence, could lower cost-effective carbon taxes.

Valuation of natural capital through ecosystem services value estimates has found application in payment for ecosystem services (PES) policies [126]. In order to safeguard social benefits from healthy ecosystems, such programs compensate private landowners for the opportunity costs of environmental stewardship [127]. PES is most common for watershed management, where downstream users compensate for upstream conservation practices, and private actor involvement raises chances of success [128]. Among publicly funded PES programs, a full land enrollment requirement can improve cost-effectiveness by reducing infra-marginal payments [129]. Compliance-based programs (e.g., ‘no net loss’) benefit from following the impact mitigation hierarchy (i.e., avoid, reduce, restore, offset) and using an offset multiplier [130].

Scarcity has been so fundamental to economics that it features in the most popular definition of the discipline [131]. Yet, it is questionable whether this focus on scarcity remains warranted. Abundance often provides a more appropriate description of the natural world than scarcity and may offer a more fruitful starting point for further exploration of the butterfly economy. In the words of Giorgos Kallis: “it is only when we begin to accept the world as abundant that we can contemplate limiting our wants and delimiting a safe space for our freedom.” [132] (p. 4) Such a reorientation that considers sources of abundance alongside scarcity opens up new possibilities for economic inquiry [133,134].

3.2. *Embed Economics in Systems Thinking*

This perspective article is not the first work in which the term butterfly economy is used: Kate Raworth contrasted a linear take–make–waste caterpillar economy with a circular butterfly economy, whereby two wings recycle biological and technological nutrients from waste back into the make stage [135]. Butterfly economics, conceptualized in this perspective, builds on such a circular economy [136,137], yet the dual objective of biodiversity conservation and human well-being is distinct from achieving a circular economy [138]. The circular economy can be considered a necessary but insufficient condition for sustainability [139], as one of several material management strategies that present trade-offs with sustainability [140], or as one of at least six other relations to sustainability [141].

The circular economy is grounded in industrial ecology [141,142], which in turn is rooted in biology and system analysis [142–145]. Industrial ecology examines the industrial metabolism more broadly, also heeding attention to non-recyclable flows and dematerialization [144,145]. Beyond closing material loops, industrial ecology has infused the circular economy with concepts such as industrial symbiosis, cradle to cradle design, and biomimicry [141,146–151]. Together with other closely related concepts such as the performance economy [152], the sharing economy [153], and related sustainable business models [154], business perceived from a systems perspective involves more than only competition [13]. Although Charles Darwin recognized the importance of cooperation [155,156], Tim Jackson describes how the excessive focus on limits and competition in economics is the

inheritance from a popular understanding of Darwin's theory of evolution, which has long overshadowed the importance of synergies from cooperation: "Nature as struggle; profit as a competition; consumption as insatiability: this is the unholy trinity of a Darwinian capitalism." [157] (p. 92).

Economics also has a rich history in cooperative and evolutionary game theory [158–161]. Agent-based models combined with behavioral experiments show that a committed minority can influence social norms [162,163] and hold promise to help identify leverage points in socio-ecological systems, especially when combined with system and group-level frames [164,165]. Embedding business in ecosystems, systems thinking and healthy human–nature relationships also seems a sensible direction, and the previous paragraph illustrates that there can be profit from cooperation, but butterfly economics focuses less on business practices. In other literature sources, one can find more detailed investigations of applying systems thinking to strategy [13], regenerative organizations [166], impact entrepreneurship [167], entrepreneurship for the public good [168], or conservation entrepreneurship [169,170].

3.3. Embed Economics in Healthy Human–Nature Relationships

Building on the theory of island biogeography [171–173], Martin Weitzman recognized a tragedy of the commons in monoculture farming, where open access to different crop varieties drives a wedge between the individually rational and socially optimal cropping decisions [174]. Similar to the fisherman who ignores the social costs of stock depletion (or fishery-induced evolution [175]), the farmer ignores the social costs of increasing risks of stock collapse. Since a larger island can maintain more species, the risk of catastrophic disease also increases with monoculture farming. Moreover, feedback on these risks is deceptively slow due to the small probabilities of disastrous events and lagged impacts [175]. Examples that appear to align closely with Weitzman's monoculture tragedy include the extinction of the Gros Michel banana [176], famine from potato blight [177], and the *Waldsterben* (i.e., forest dying) of monoculture production forests [178].

A more common consequence of the monoculture tragedy is pesticide lock-in [179–182]. Since monoculture farming is more sensitive to 'pests' that specialize in eating the monoculture in question, there are large short-run returns to investment in pesticide adoption during a crop boom [99,183]. Roughly two-thirds of global agricultural lands contain pesticide residues that exceed safe concentrations, of which half exceed such levels by at least three orders of magnitude, and a third of this latter high-risk category is located in biodiversity hotspots [184]. Pesticide use triggers a reinforcing feedback loop of dependency, whereby pesticide application leads to resistance in target species and reduces biological control services from natural predators through collateral damage to non-target species [182]. The pesticide treadmill reduces long-run profit margins of farmers and entails associated social and ecological costs [38,182]. This pesticide trap is not only ecological; there also exist socio-technical lock-in mechanisms through the influences of suppliers and regulations [185]. While the monoculture problem was introduced in the previous paragraph using the commons metaphor, policy solutions likely benefit from a fractal lens, which recognizes recurring, self-organizing, and interdependent lock-in patterns [186].

While monoculture farming and associated practices are exemplary of unsustainable relationships to nature, traditional farming systems often maintain biodiversity-friendly practices [187]. Such reconnection with nature stretches beyond agriculture and can be pursued through equitable access to green spaces and environmental education [188,189]. Progress towards forming healthier human–nature relationships can be monitored through validated measures (e.g., [190–193]) and novel animal quality-adjusted life year measures [194].

4. A Butterfly Paradox

As I move towards my closing statement in response to the special issue and its call to reimagine human–nature relationships for biodiversity conservation, I argue that the proverb “Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime” has become an incomplete advice in the Anthropocene without the addition of “preserve the fish stock and feed generations”.

Biodiversity conservation is complex and full of paradoxes [45,195–197]. For example, the preservation of a species may be best served by focusing conservation efforts on another species. Butterfly conservation can benefit from attention to plants and ants, since several butterfly species have obligate relations to host plants [198], whereas others are obligate myrmecophiles or ant parasites [155,198]. Such a butterfly paradox provides a valuable perspective for the human prospect as well. The Anthropocene characteristic of human dominance over natural processes has increased the urgency to shift away from anthropocentrism. A heterodox economics of biodiversity conservation seems most suitable to incorporate the plural values of nature [199–201].

Rebranding the spaceman economy to the butterfly economy adds consideration of abundance and has the aspiration to direct economics towards biodiversity conservation, in line with Mill’s motivation for a stationary state, “. . . solitude in the presence of natural beauty and grandeur, is the cradle of thoughts and aspirations which are not only good for the individual, but which society could ill do without.” [54] (p. 756). Butterfly economics meets boundaries of inquiry when it comes to value frames such as ‘living with nature’ and ‘living as nature’ [201]. Intrinsic values of nature relate to rights of nature and raise legal questions [126,202,203].

The predominant biodiversity conservation strategy through protected areas has delivered mixed success [204,205]; unsuccessful protection can be due to siting choices that are concentrated toward lands with low opportunity costs and little development pressure [206,207], protected area downgrading, downsizing, and degazettement [208], underfunding [209], and possibly a green paradox [210,211]. While protected areas surely continue to play an important role in biodiversity conservation, proposals to extend protected status to half of the Earth may not deliver the envisioned conservation benefits [212–214]: Such proposals do little to address systemic threats, may lead to the displacements of marginalized communities, provide no guidance on implementation, and offer no measures for conservation on the human half [215]. Instead, a Whole Earth approach to conservation advocates co-existence with other species, guided by degrowth, decolonization, decommodification, and convivial conservation [216,217].

Butterflies have been a source of inspiration for centuries, and their study has led to numerous innovations [218]. For example, the structural color from the nanostructures of its wing scales has inspired anti-counterfeiting technology, light-reflective coatings, and waterproof materials [218,219]. Butterflies are also a textbook example of charismatic flagship species for conservation [220–222], which may be leveraged to benefit broader biodiversity objectives through place-based conservation [223] or to overcome plant blindness and garner support for plant conservation [224–226]. Similarly, fascination with metamorphosis could possibly be harnessed to incite excitement about less charismatic insects [227–229]. Lastly, I believe butterfly metamorphosis provides an apt analogy for the transformative change advocated by conservation institutions and hope that the above exploration inspires further research in pursuit of healthy human–nature relations towards a just and sustainable butterfly economy.

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